

Amendments to the Claims:

Claims 1-18 are pending in this application. Claims 9-18 are withdrawn from consideration. Among the remaining claims in consideration (i.e., claims 1-8), claim 1 is independent.

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1-8 (CANCELLED):

9 (WITHDRAWN): A position detection apparatus for detecting the position of an object upon receiving light from a plurality of position detection marks on the object, comprising:

an image information acquisition unit for obtaining image information of the position detection marks from the light that has been received;

a conversion unit for converting the image information to a light-intensity signal for each line of a plurality of lines partitioned in a direction substantially orthogonal to a direction in which the position detection marks are detected;

a determination unit for determining whether the light-intensity signal of each line is valid or not; and

a position information calculation unit for calculating position information of the position detection marks from light-intensity signals of valid lines.

10 (WITHDRAWN): The apparatus according to claim 1, further comprising an error information calculation unit for calculating error information representing an error of a position detection mark, which corresponds to the position information, with respect to a reference position.

11 (WITHDRAWN): An exposure apparatus having a stage device driven in order to position the object based upon error information calculated by the position detection apparatus set forth in claim 10;

said stage device positioning a substrate or a reticle or both as the object.

12 (WITHDRAWN): A method of manufacturing a semiconductor device, comprising the steps of:

placing a group of manufacturing equipment for various processes, inclusive of the exposure apparatus set forth in claim 11, in a plant for manufacturing semiconductor devices; and

manufacturing a semiconductor device by a plurality of processes using this group of manufacturing equipment.

13 (WITHDRAWN): The method according to claim 12, further comprising:

interconnecting the group of manufacturing equipment by a local-area network; and

communicating, by data communication, information relating to at least one piece of manufacturing equipment in said group thereof between the local-area network and an external network outside said plant.

14 (WITHDRAWN): The method according to claim 13, wherein maintenance information for said manufacturing equipment is obtained by accessing, by data communication via the external network, a database provided by a vendor or user of said exposure apparatus, or production management is performed by data communication with a semiconductor manufacturing plant

other than said first-mentioned semiconductor manufacturing plant via the external network.

15 (WITHDRAWN): A semiconductor manufacturing plant, comprising:

a group of manufacturing equipment for various processes, inclusive of the exposure apparatus set forth in claim 11;

a local-area network for interconnecting the group of manufacturing equipment;
and

a gateway for making it possible to access, from said local-area network, an external network outside the plant;

whereby information relating to at least one of the pieces of manufacturing equipment can be communicated by data communication.

16 (WITHDRAWN): A method of maintaining the exposure apparatus, which is set forth in claim 11, installed in a semiconductor manufacturing plant, comprising the steps of:

providing a maintenance database, which is connected to an external network of the semiconductor manufacturing plant, by a vendor or user of the exposure apparatus;

allowing access to said maintenance database from within the semiconductor manufacturing plant via said external network; and

transmitting maintenance information, which is stored in said maintenance database, to the side of the semiconductor manufacturing plant via said external network.

17 (WITHDRAWN): The apparatus according to claim 11, further comprising a display, a network interface and a computer for running network software;

wherein maintenance information relating to said exposure apparatus is capable of

being communicated via a computer network by data communication.

18 (WITHDRAWN): The apparatus according to claim 17, wherein the network software provides said display with a user interface for accessing a maintenance database, which is connected to an external network of a plant at which said exposure apparatus has been installed, and which is provided by a vendor or user of the exposure apparatus, thereby making it possible to obtain information from said database via said external network.

19 (NEW): A position detection method for detecting position, in a first direction, of a mark formed on an object, said method comprising steps of:

detecting an image of the mark to obtain two-dimensional image information of the mark;

calculating position of the mark with respect to each of a plurality of segments of the two-dimensional image information, regions of the plurality of segments being different from each other in a second direction orthogonal to the first direction;

selecting a segment from the plurality of segments based on the calculations corresponding to the plurality of segments; and

finding position of the mark using the calculated position corresponding to the selected segment.

20 (NEW): A method according to claim 19, wherein said calculating step calculates positions of elements of the mark and finds an interval of the elements with respect to each of the plurality of segments, and said selecting step selects a segment from the plurality of segments based on the calculated intervals corresponding to the plurality of segments.

21 (NEW): A method according to claim 19, said calculating step further finds an approximation equation, which approximately represents the calculated position of each of a plurality of marks formed on the object detected in said detection step, and a variation of approximation errors of the approximation equation, with respect to each of the plurality of segments, and said selecting step selects a segment from the plurality of segments based on the found variations corresponding to the plurality of segments.

22 (NEW): A method according to claim 19, wherein said calculating step calculates position of the mark using a template matching method, and a difference between a template and a best-matched signal in the two-dimensional image information, with respect to each of the plurality of segments, and said selecting step selects a segment from the plurality of segments based on the calculated differences corresponding to the plurality of segments.

23 (NEW): A method according to claim 19, wherein the object is a semiconductor substrate exposed to light by an exposure apparatus, and the mark is one of an alignment mark and an overlay verification mark.

24 (NEW): A method according to claim 19, wherein the object is a semiconductor substrate exposed to light by an exposure apparatus, the mark is an overlay verification mark, and said finding step finds an overlay error.